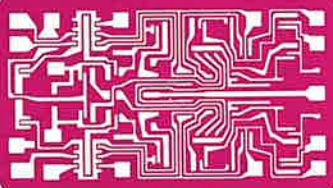
quick reference guide

integrated circuits...



...digital and linear

Molecular Electronics Division

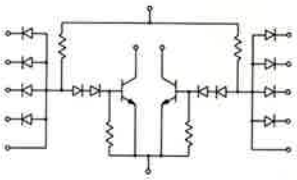
91-000
March 1966

WM 200 DTL NAND family of integrated circuits

Design features

- High speed with average switching times 19 ns
- Noise margin typically 1 volt, and guaranteed minimum 550 mv
- Fan-out 11 minimum per gate function
- Low power dissipation averaging 7.5 mw per gate
- Single 6 volt power supply required
- Full military —55°C to +125°C operating temperature range
- Designed to meet MIL-S-19500 and MIL-M-23700

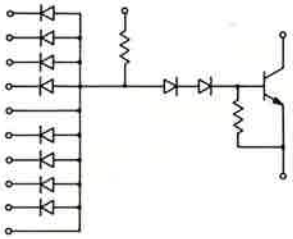
WM 231 Dual NAND Gate 4 input with nodes



Design features

- Average switching time 19 ns
- Fan-out 11 each gate
- Power consumption 15 mw
- G package

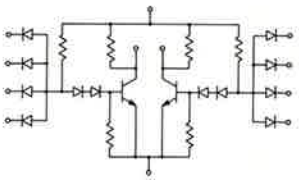
WM 224 Single NAND Gate 8 input with node



Design features

- Average switching time 23 ns
- Fan-out 11
- Power consumption 7.5 mw
- T or G package

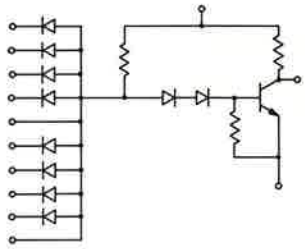
WM 241 Dual NAND Gate 4 input, with collector resistors



Design features

- Average switching time 23 ns
- Fan-out 10 each gate
- Power consumption 22 mw
- G package

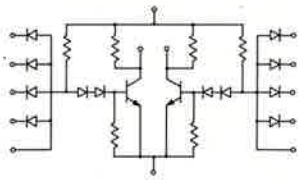
WM 234 Single NAND Gate 8 input with code, collector resistors



Design features

- Average switching time 28 ns
- Fan-out 10 each gate
- Power consumption 11 mw
- G package

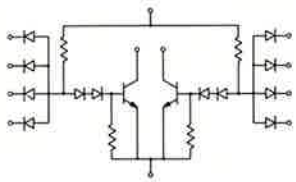
WM 261 Dual NAND Gate 4 input with nodes, collector resistors



Design features

- Average switching time 23 ns
- Fan-out 10 each gate
- Power consumption 22 mw
- G package

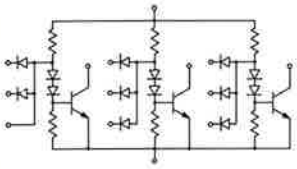
WM 211 Dual NAND Gate 4 input



Design features

- Average switching time 19 ns
- Fan-out 11 each gate
- Power consumption 15 mw
- T or G package

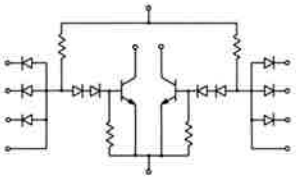
WM 206 Triple NAND Gate Two 3 inputs; one 2 input with node



Design features

- Average switching time 19 ns
- Fan-out 11 each gate
- Power consumption 22.5 mw
- G package

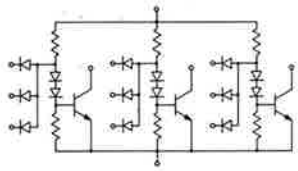
WM 221 Dual NAND Gate 3 input with nodes



Design features

- Average switching time 19 ns
- Fan-out 11 each gate
- Power consumption 15 mw
- T or G package

WM 216 Triple NAND Gate Three 3 inputs

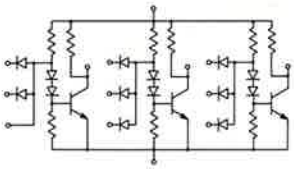


Design features

- Average switching time 19 ns
- Fan-out 11 each gate
- Power consumption 22.5 mw
- G package

Digital Circuits

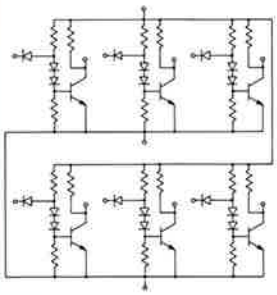
WM 226 Triple NAND Gate Two 3 inputs, one 2 input with node, collector resistors



Design features

- Average switching time 23 ns
- Fan-out 10 each gate
- Power consumption 33 mw
- G package

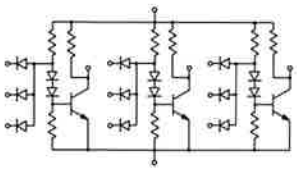
WM 296 Hex NAND Gate Six 1 input; collector resistors



Design features

- Average switching time 23 ns
- Fan-out 10 per gate
- Power consumption 66 mw
- G package

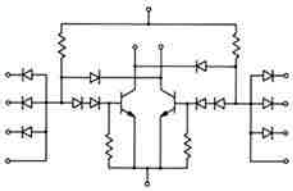
WM 236 Triple NAND Gate Three 3 inputs, collector resistors



Design features

- Average switching speed 23 ns
- Fan-out 10 each gate
- Power consumption 33 mw
- G package

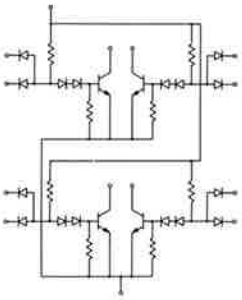
WM 212 RS flip flop 3 input with nodes



Design features

- Average switching time 19 ns
- Fan-out 10 each gate
- Power consumption 15 mw
- T or G package

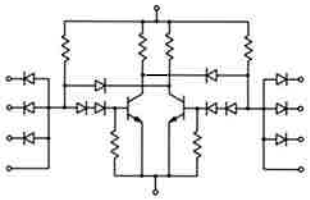
WM 246 Quad NAND Gate Four 2 input



Design features

- Average switching time 19 ns
- Fan-out 11 each gate
- Power consumption 30 mw
- G package

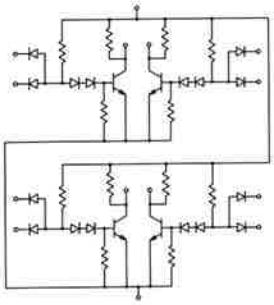
WM 222 RS flip flop 3 input with nodes, collector resistors



Design features

- Average switching time 23 ns
- Fan-out 10 each gate
- Power consumption 22 mw
- G package

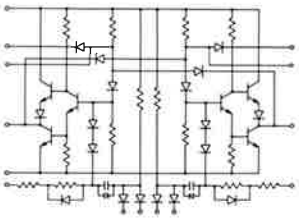
WM 266 Quad NAND Gate Four 2 input; collector resistors



Design features

- Average switching time 23 ns
- Fan-out 10 each gate
- Power consumption 44 mw
- G package

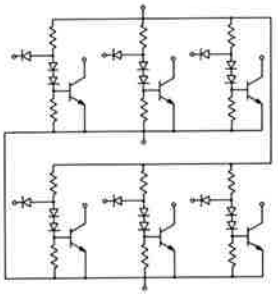
WM 215 JK flip flop



Design features

- Average switching time 80 ns
- Clock rate 15 MHz
- Fan-out 9
- Power consumption 45 mw
- T or G package

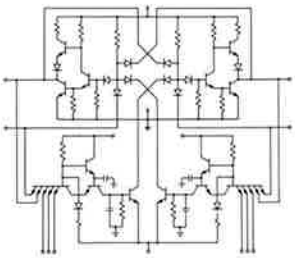
WM 286 Hex NAND Gate Six 1 input



Design features

- Average switching time 19 ns
- Fan-out 11 per gate
- Power consumption 45 mw
- G package

WM 225 JK flip flop

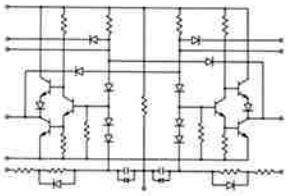


Design features

- Average switching time 55 ns
- Clock rate 15 MHz
- Fan-out 10
- Power consumption 40 mw
- G package

Digital Circuits

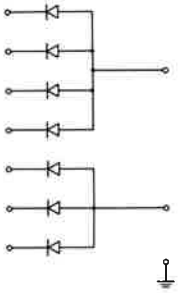
WM 213 pulse binary counter



Design features

- Counting rate 12 MHz
- Average switching time 60 ns
- Fan-out 9
- Power consumption 50 mw
- T or G package

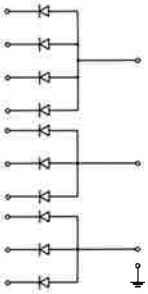
WM 217 diode array



Design features

- Inputs expandable to 7
- Diode breakdown 15 volts
- Diode recovery time 4 ns
- Capacitance at zero bias 4 pf
- T or G package

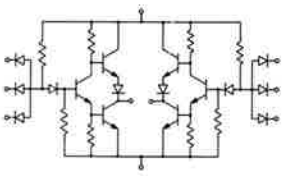
WM 227 diode array



Design features

- Inputs expandable to 10
- Diode breakdown 15 volts
- Diode recovery time 4 ns
- Capacitance at zero bias 4 pf
- G package

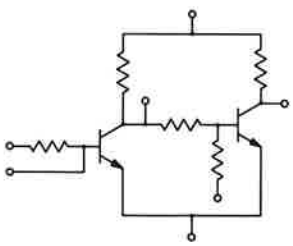
WM 210 line driver Two 3 input



Design features

- Average switching time 37 ns
- Fan-out 22
- Power consumption 30 mw
- Drives high capacitance loads
- T or G package

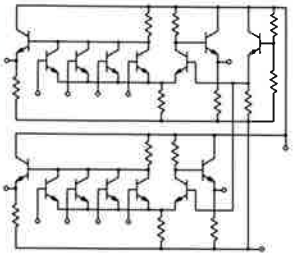
WM 208 Level Detector — Schmitt Trigger



Design features

- Low hysteresis
- Low triggering current 200 μa maximum
- Low power consumption 14 mw typical
- Adjustable triggering voltage
- Compatible with DTL gates
- T or G package

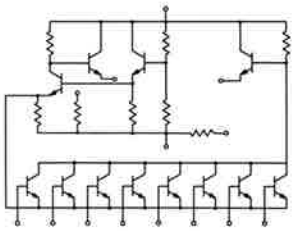
WS 371 Dual 4 input CML NOR-OR Gate



Design features

- Propagation delay 4 ns with fan-out of 1 and 25 pf loading
- Propagation delay 10 ns with fan-out of 6 and 105 pf loading
- Fan-out to 15
- Power consumption per gate 95 mw
- Q package

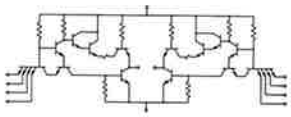
WS 374 Single 8 input CML NOR-OR Gate



Design features

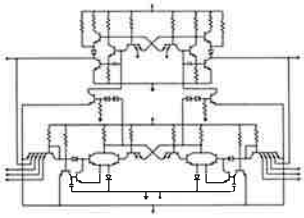
- Propagation delay 4 ns with fan-out of 1 and 25 pf loading
- Propagation delay 10 ns with fan-out of 6 and 105 pf loading
- Fan-out to 15
- Power consumption per gate 95 mw
- Q package

WM 501 High speed dual NAND gate



- Average switching time 7 ns
- Fan-out 6
- Power consumption 42 mw
- G package

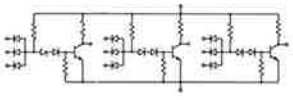
WM 503 JK flip flop



Design features

- Average switching time 20 ns
- Counting rate 20 mc
- Fan-out 10
- Power consumption 75 mw
- G package

WM 506 Triple NAND Gate Three 3 inputs, collector resistors

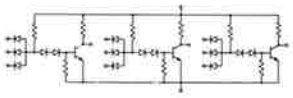


Design features

- Average switching time 12.5 ns
- Fan-out 10 each gate
- Power consumption 19 mw
- G package

Digital Circuits

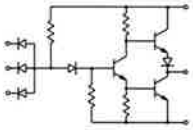
WM 556 Triple NAND Gate Three 3 inputs, collector resistors



Design features

- Average switching time 16 ns
- Fan-out 12 each gate
- Power consumption 10 mw
- G package

WS 811 Dual NAND Gate

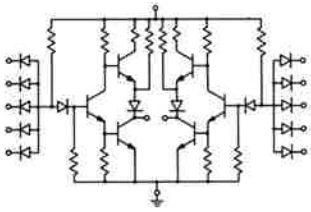


Repeat circuit

Design features

- Switching time 50 ns into 100 pf
- Power consumption 50 mw per gate
- Fan-out 10 minimum
- Q package

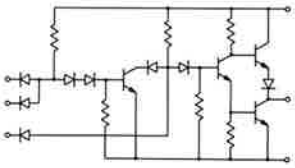
WM 510 Dual NAND driver Two 5 inputs with nodes



Design features

- Average switching time 23 ns
- Fan-out 27 each gate
- Drives high capacitance loads
- Power consumption 10 mw per gate

WS 813 AND NAND Gate

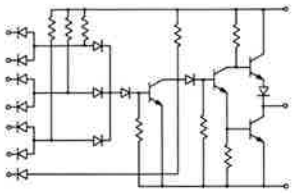


Repeat circuit

Design features

- Power consumption 5 mw per gate
- Fan-out 10 minimum
- Can be used as half shift register
- Q package

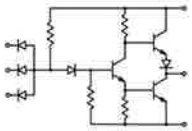
WS 810 AND OR NAND Gate 7 inputs, 1 output



Design features

- Ring propagation delay 50 ns maximum
- Fan-out 10 minimum
- Power consumption 20 mw maximum
- Q package

WS 817 Dual NAND Line Driver

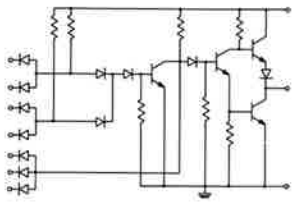


Repeat circuit

Design features

- Switching time 65 ns into 230 pf
- Power consumption 7 mw per gate
- Fan-out 25 minimum
- Q package

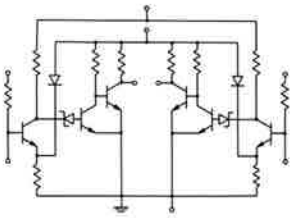
WS 812 AND OR NAND Gate 7 inputs, 1 output



Design features

- Ring propagation delay 50 ns maximum
- Fan-out 10 minimum
- Power consumption 15 mw maximum
- Q package

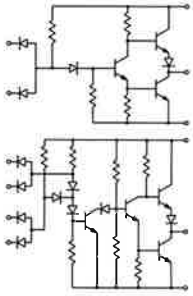
WS 815 Dual Interface Analog/Digital Matching Circuit



Design features

- Low input resistance 7 KΩ
- Power consumption 60 mw
- Converts 1.5 to 3.0 volt inputs into 2.0 volt outputs
- Converts 5.5 to 12.0 volt inputs into 0.5 volt outputs
- Q package

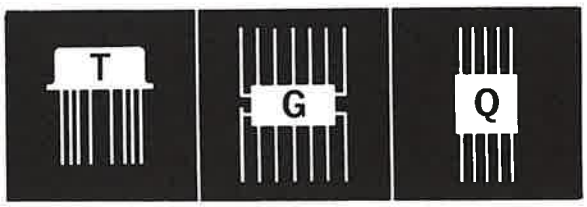
WS 814 AND OR NAND Gates 6 inputs, 1 output



Design features

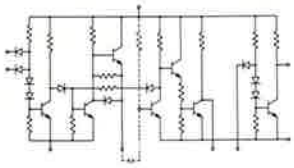
- Ring propagation delay 50 ns maximum
- Fan-out 10 minimum
- Power consumption 20 mw maximum
- Q package

packages



Peripheral Circuits

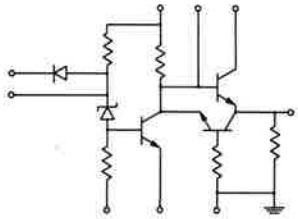
WS 841 Monostable multivibrator



Design features

- Output pulse range 1 sec to 100 ns
- Inverter fan-out 10
- Repetition rate to 4 MHz
- Up to 92% duty cycle
- Q package

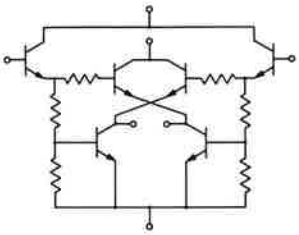
WS 150 Interface circuit-level shifter



Design features

- Converts ZERO level logic to +6.3v output and ONE level logic to —6.3v output
- Output impedance 10Ω
- Q package

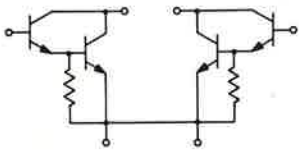
WS 151 Destructive readout bit driver



Design features

- Input impedance 5KΩ minimum
- Power consumption 150 mw maximum
- Core driving current to 150 ma
- Q package

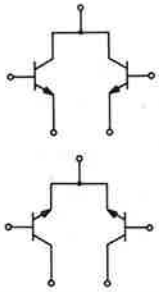
WS 153 Dual Darlington



Design features

- h_{fe} 500 minimum
- I_{CBO} 5μa maximum
- Switching time 150 ns
- Q package

WS 154 Quad transistor

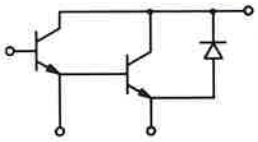


Design features

- Multiple core driving capacity
- Isolated pair configuration
- h_{fe} 30 at 100 ma; 15 at 1 amp
- Q package

Linear Circuits

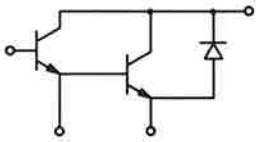
WS 140 Power switch



Design features

- DC beta, 1,500 minimum at 2 amps
- Turn-on time 450 ns maximum
- Power dissipation 20 watts pulsed
- BV_{CEO} 40 volts
- V_{CE} (sat) 1.2 volts maximum at 2 amps
- ⅝" circular "Satellite" package with 4 radial leads

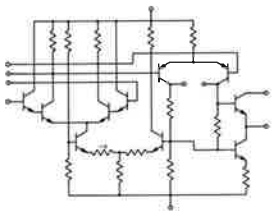
WS 145 Power switch



Design features

- DC beta 1,500 minimum at 2 amps
- Turn-on time 450 ns maximum
- Power dissipation 20 watts pulsed
- BV_{CEO} 70 volts
- V_{CE} (sat) 1.2 volts maximum at 2 amps
- ⅝" circular "Satellite" package with 4 radial leads

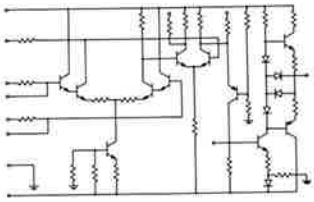
WS 161 Operational amplifier



Design features

- Input impedance 300KΩ minimum
- Output impedance 40Ω maximum
- Differential gain 2,000 typical
- Frequency response to 500 KHz (—3db point)
- Drift 5μv and 1na/°C
- Output swing 14 volts minimum
- Q package

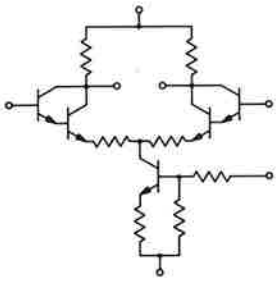
WS 174 Operational amplifier



Design features

- Input impedance 100 KΩ minimum
- Output impedance 200Ω maximum
- Differential gain 50,000 typical
- Frequency response to 100 KHz (—3db point)
- Drift 15μV/°C
- Output swing 20 volts minimum
- Q package

WS 115 Differential Amplifier

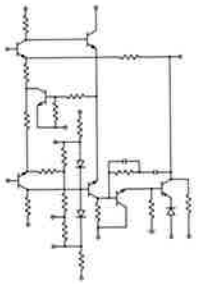


Design features

- Gain 40 minimum
- High input impedance 300 KΩ minimum
- Low drift 10 μv/°C typical
- Frequency response to 150 KHz typical
- High common mode rejection ratio typically 80 db
- G package

Linear Circuits

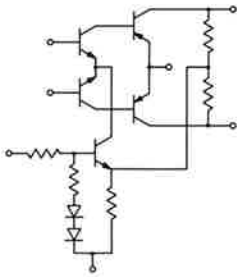
WS 123 Differential Amplifier



Design features

- Gain 250 ±30
- High input impedance of 150 KΩ minimum
- Low drift 10 μv/°C typical
- Frequency response to 100 KHz minimum
- High common mode rejection ratio typically 90 db
- G package

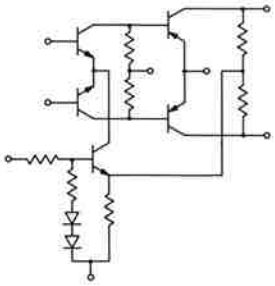
WS 142 Differential Amplifier



Design features

- Gain 150 minimum
- High imput impedance 20 KΩ minimum
- Low drift 10 μv/°C typical
- Frequency response to 100 KHz minimum
- High common mode rejection ratio typically 80 db
- G package

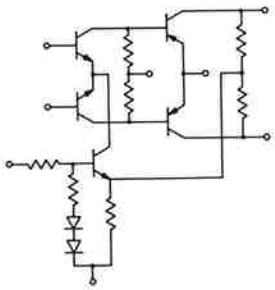
WS 143 Differential Amplifier



Design features

- High gain 1,000 minimum
- High input impedance 10 KΩ minimum
- Low drift 10 μv/°C typical
- Frequency response to 48 KHz minimum
- High common mode rejection ratio typically 80 db
- G package

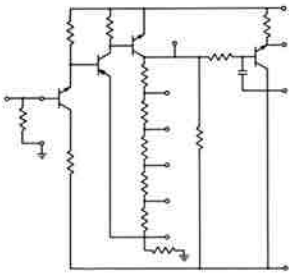
WS 144 Differential Amplifier



Design features

- High gain 1,500 minimum
- Input impedance 2 KΩ minimum
- Low drift 10 μv/°C typical
- Frequency response to 100 KHz minimum
- High common mode rejection ratio typically 80 db
- G package

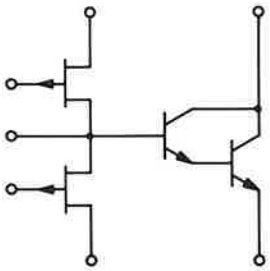
WS 934 Read Preamplifier



Design features

- High input impedance 180 KΩ minimum
- Low output impedance 100 Ω maximum
- Frequency response to 1 MHz
- Gain 30 at mid-frequency
- Gain externally variable from 30 to 2 in 30 increments
- G package

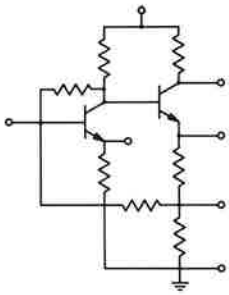
WM 1108 Unibi Audio Amplifier



Design features

- Field effect transistor input
- Input impedance 10 megohms typical
- Frequency response DC to 100 KHz
- G_m 20,000 μmhos typical
- Monolithic unipolar-bipolar construction
- Q package

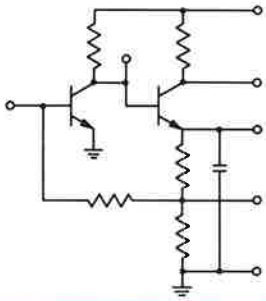
WS 112 Pulse Video Amplifier



Design features

- Frequency response DC to 7 MHz
- Voltage and current gain 24 db typical
- Pulse rise and fall times 30 ns typical
- Equivalent wideband input noise 50 μv
- T package

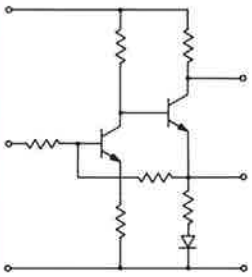
WM 1146 Wideband Video Amplifier



Design features

- Unity gain above 100 MHz
- 16 db gain at 60 MHz
- 6 to 12 VDC operation
- Single power supply
- Q package

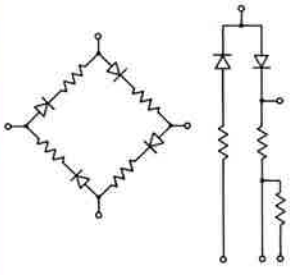
WM 167 Servo Preamplifier



Design features

- Low input impedance 250 Ω for stable summing
- Output impedance 3.9 KΩ
- Voltage gain 300 typical stable over temperature range.
- Frequency response to 250 KHz
- Linearity error less than 5% at 9 vrms
- T package

WM 168 Servo Demodulator-Modulator

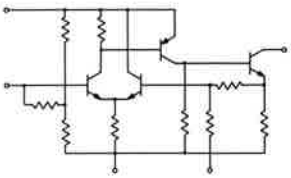


Design features

- High degree of balance
- Two functions in single package
- Provides for external shaping network
- Operates directly from output of WM 167 servo preamplifier
- Capable of 35 vrms reference excitation
- T package

Linear Circuits

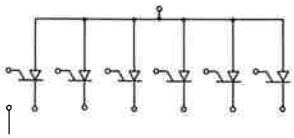
WM 169 Servo Amplifier



Design features

- Input impedance 10 KΩ minimum
- Gain of 90 typical
- Operates any hydraulic servo valve
- Drives up to 5 ma in valve coils
- Operates from 28 volt supply
- T package

WS 171 Six SCR Array

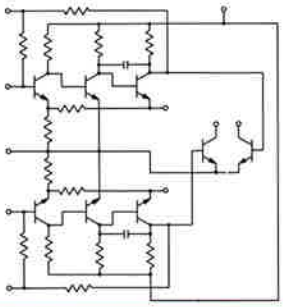


Design features

- Forward drop under 1.8v
- Breakover voltage 40v minimum
- Gate current under 120 μa
- Parasitic isolation current under 3 ma
- Hold off voltage over 10v/μ sec.
- Q package

Commercial Linear Circuits

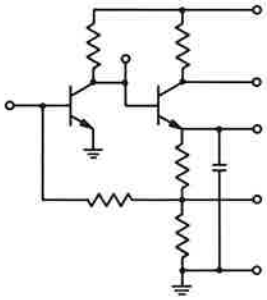
WC 183 Low Level Audio Amplifier



Design features

- 90 db gain at V_{cc} of 4.5 volts
- 60 db minimum gain at V_{cc} of 1.55 volts
- Quiescent current less than 1 ma
- Efficiency 55%
- T or G package

WC 1146 Wideband Video Amplifier



Design features

- Unity gain above 100 mc
- 16 db gain at 60 MHz
- 6 to 12 VDC operation
- Single power supply
- Q package

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